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METHOD OF PLATING METAL ARTICLE WITH METAL

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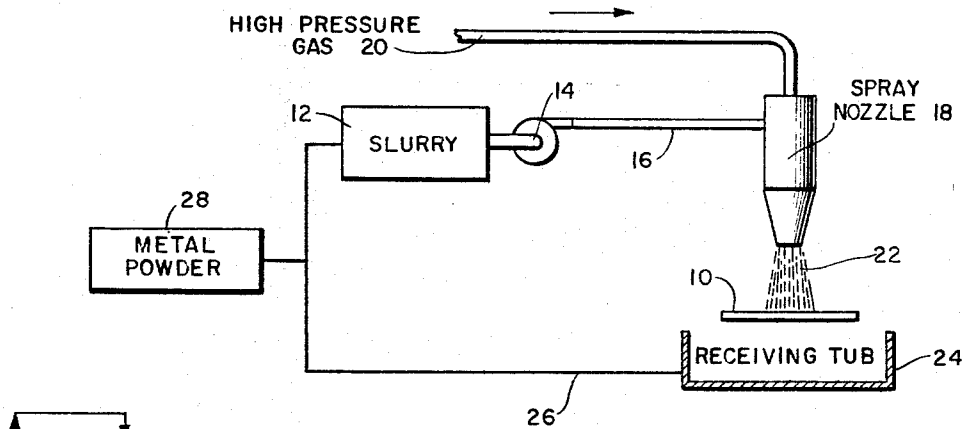


FIG. 1.

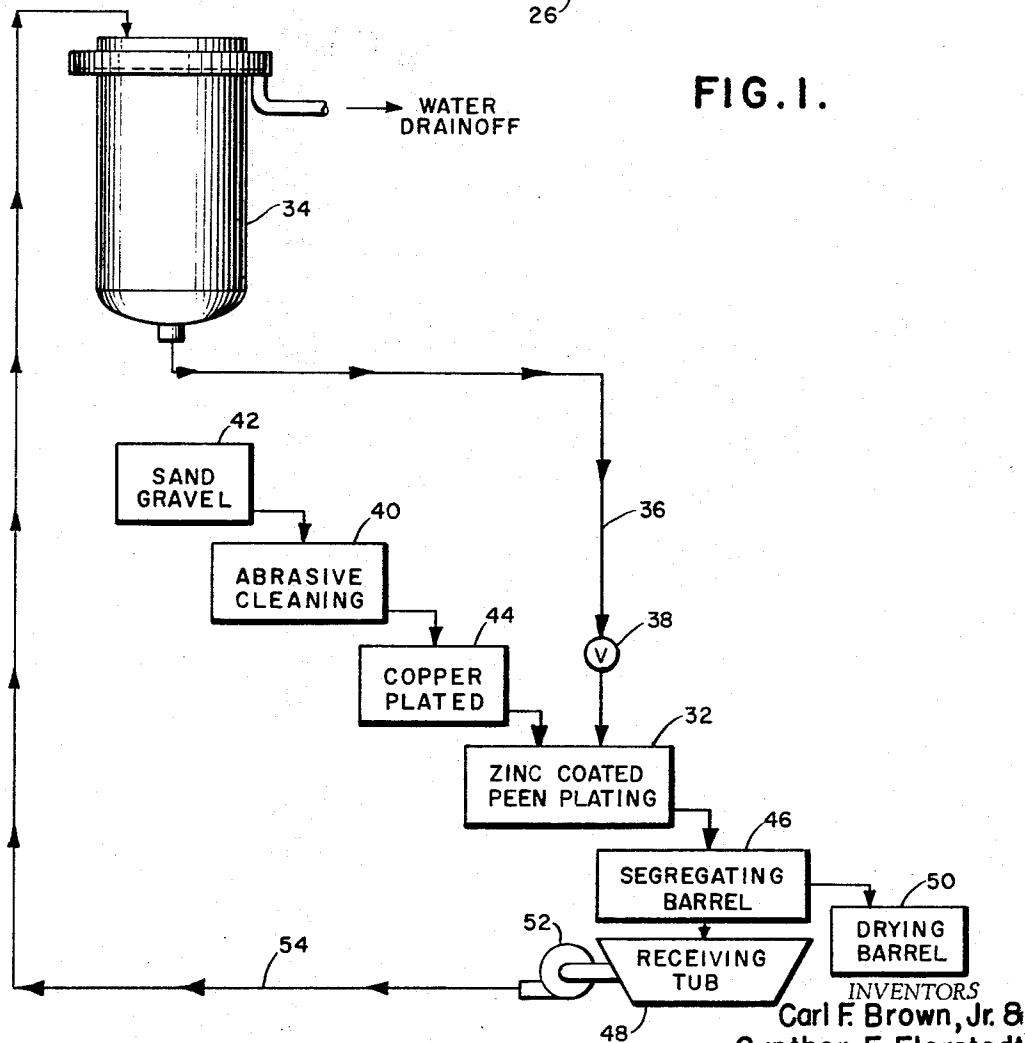


FIG. 2.

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METHOD OF PLATING METAL ARTICLE WITH METAL

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The present invention relates to the coating of metal surfaces and more particularly to the blast plating of metals onto surfaces.

This invention relates to the metal plating of objects without the application of melting heat or electricity.

Heretofore methods have been suggested for plating of small objects involving the impact of very small particles of metal against the objects to be coated; however, prior methods have not been entirely successful, and furthermore, such methods have not been found applicable to the coating of large sheets or other flat surfaces.

It is therefore an object of the present invention to provide a method of metal plating which requires no melting of the metal or electricity and which is equally applicable to the plating of small or large objects or flat surfaces.

A further object of the present invention is to provide a method of metal plating whereby any desired thickness of coat may be obtained.

A still further object of the present invention is to provide an improved coating composition for use in blast plating.

Another object of the present invention is to provide improved means for blast plating various types of surfaces.

Other objects and the nature and advantages of the instant invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a diagrammatic view of the invention showing a single large object being plated, and

FIG. 2 is a similar view showing the plating of a plurality of small objects in a tumbler.

According to the present invention thin metal coatings are deposited on either metallic and non-metallic objects by a "blast plating" technique which involves the blasting of a mixture of powdered metal and an impact means such as small glass beads onto the surface of the object to be plated. The blasting may be effected by use of a high pressure gas through a nozzle to force the mixture against the object to be plated at a high velocity. The mixture may be either a dry mixture or an aqueous slurry.

The surface to be plated should first be cleaned to remove all rust, scale, or loose material and to activate the surface, such as by sand blasting, chemical treatment, or the like. If the object to be plated is a large surface 10 as shown in FIG. 1, the mixture may be pumped from a source of supply 12 by pump 14 through line 16 to a blast nozzle 18. High pressure gas is fed through line 20 to the nozzle, and the mixture 22 is blasted onto the surface 10.

As shown in the drawings, a water slurry of the mixture is used. After the blasting step, the slurry is collected in a receiving tub 24 and is returned by line 26 to the source of supply 12. A metal powder storage container 28 is located so that make-up metal powder may be added to line 26 to compensate for the metal powder plated out on the object 10.

The glass beads act as the impact media, that is, the means for mechanically forcing the metal powder to adhere to the surface being plated, and is particularly effective with the plating of contoured surfaces to give more uniform coatings than can be obtained with other methods.

When a plurality of small objects are to be plated, such as bolts, nuts, nails or screws or the like, a tumbler 32, see FIG. 2, is filled with the small objects and while the parts are agitated therein, the mixture from the source of supply 34 is pumped through line 36 and valve 38 to a blast nozzle located in the tumbler 32, from whence it is blasted against the objects by a blast of gas under high pressure which also enters the nozzle. The nozzle and source of gas under pressure are not shown in the diagram. The small objects to be plated may first be cleaned abrasively at 40 by means of sand from a supply container 42. The cleaned objects may then be copper plated at 44 and then conducted to the tumbler 32 where they are zinc plated by means of a blast of the mixture of glass beads and zinc powder. After the plating operation, the objects and mixture are transferred to a segregating barrel 46 wherein the slurry mixture is drawn off into a receiving tub 48 and the plated objects are transferred to the drying barrel 50. From the receiving tub, the slurry is pumped by pump 52 through line 54 back to the slurry tank 34. Additional zinc powder may be added as needed to the slurry to make up for the powder plated onto the objects.

The present process is applicable for plating with powdered zinc, tin, lead, aluminum, cadmium, copper, nickel, magnesium, silver, gold, bronze, chrome and other metals and alloys of these metals.

In addition, it is contemplated that the present invention is applicable for plating or coating surfaces with a dry lubricating powder such as molybdenum disulfide, colloidal graphite, or the like. This yields a uniform application of dry lubricants to bearing surfaces.

A very satisfactory mixture of glass beads to metal powders is 2 to 1, however satisfactory plating occurs with a ratio of glass beads to metal powder of 8 to 1, and plating will occur even when the ratio of beads to metal powder is 15 to 1.

The glass beads are preferably a mixture of beads varying in diameter between 1 to 60 mils, but this may be varied depending on the results desired. These small glass beads are especially advantageous in the plating of irregular shaped objects. Glass beads also have the advantage of preventing contamination that is likely to be found when using the metal balls, previously proposed.

The glass beads are preferably spherical in shape; however, they may be spheroidal. The term, spheroidal, is meant to include any curved solid having rounded edges.

The metal powder may be either flake or granular. The flake material is preferred; however, the process itself results in a flattening of the granular metal into a skin covering to the article. The flake metal powder plates somewhat faster than the granular material.

When a liquid slurry is used, a satisfactory mixture is 5 parts of the mixture of metal and glass beads to 4 parts of liquid. The range which is advantageous is from 7 parts metal and glass beads to 1 part of liquid and 1 part of metal and glass beads to 4 parts liquid.

The liquid slurry preferably also contains a plating promoter or catalyst to facilitate the plating action. Among such promoters are sodium alginate and ammonium hydroxide, also starch, carboxy-methyl cellulose and the like can be used in place of sodium alginate when aqueous slurries are used. When the dry process is used, no promoters are needed, and only the mixture of glass spheres and metallic powder is used. The ammonium hydroxide is added in a ratio of 2-10% by volume of water used. The other chemicals, e.g., carboxy-methyl cellulose, is added in a ratio of 0.25-3% of water used. Other satisfactory plating promoters are disclosed in Reissue Patent 23,861.

In a specific example, the slurry was made up as follows:

	Parts by volume
Glass beads -----	4.0
Zinc powder -----	2.0
Ammonium hydroxide -----	0.2
Carboxy-methyl cellulose -----	0.5
Water -----	4.0

The zinc powder had a particle size of less than 0.01" in the major dimension. The glass beads were a mixture of sizes varying from 10 to 30 mils. The blast nozzle in the tumbling plating drum was a whirling or oscillating nozzle. The parts to be zinc plated had an initial copper coat and upon removal from the tumbling drum were found to be uniformly coated with the zinc.

In another example powdered molybdenum disulfide was substituted for the zinc powder and the resulting surfaces were found to have a uniform lubricant coating thereon.

It has also been found that the density of the glass used is extremely important. For example, comparative results between glass beads having densities of 1.5 and 3.0 respectively show that better results are obtained in this process using the heavier beads. Similarly it was found that high density glasses having densities of 3.1 to 7.6 or higher gave excellent results.

Particularly good results have been obtained in coating metal surfaces such as iron, steel, bronze and other metals which are dissimilar from the plating metal.

The success of the present process is based on the high velocity of the plating particles and the impact media due to the gas blast. The high velocity may be imparted to the particles by other means such as hydraulic pumps, mechanical slinger wheels, propeller and the like. This is to be contrasted with previously proposed methods utilizing gravity only as in the conventional tumbling drum.

For certain purposes glass cullet or other irregular shaped hard material may be included in the impact media.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A method of mechanically plating metallic articles

which comprises blasting at ordinary temperatures at a high velocity against said metallic articles to be plated an aqueous slurry comprising 1-7 parts of a mixture of a finely divided material to be plated onto the article and spheroidal glass beads and 1 to 4 parts of water, said finely divided material being selected from the group consisting of zinc, tin, lead, aluminum, cadmium, copper, nickel, magnesium, silver, gold, bronze, chrome, molybdenum disulfide and graphite, said glass beads having a diameter from 1-60 mils and a density greater than 3.1, the ratio of said glass beads to said finely divided material in said mixture being between 2:1 and 15:1.

2. A method in accordance with claim 1, wherein said slurry is hydraulically pumped to a spray nozzle and the blasting is caused by high pressure gas also fed to the nozzle, collecting said slurry after contact with said articles to be plated and recycling said slurry after replenishing with additional finely divided material to said spray nozzle.

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